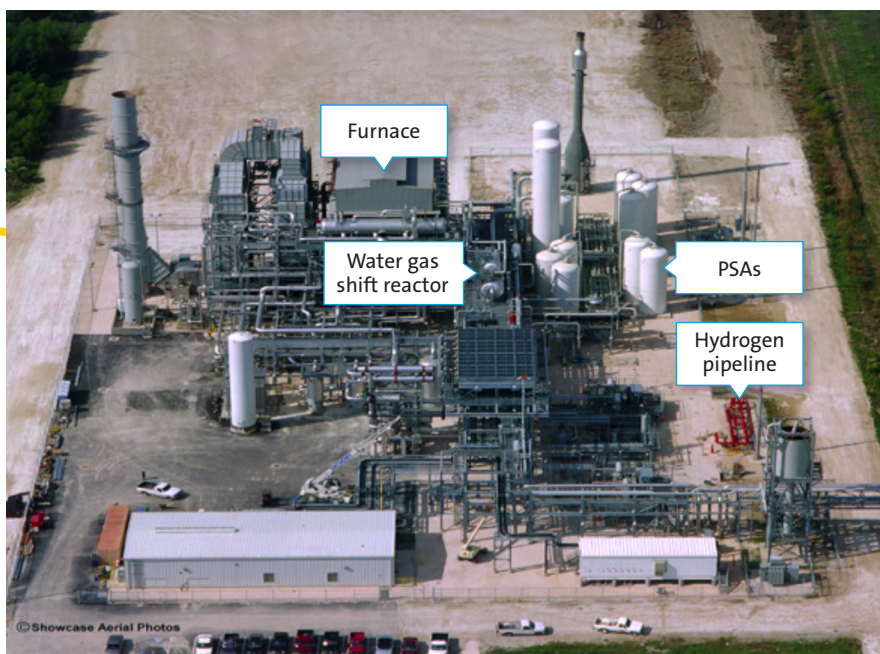


Steam methane reformer overview



This 80 million standard cubic feet per day (MMSCFD) steam methane reformer (SMR) in Pasadena, Texas, came onstream in 1996 and is one of over 20 hydrogen production facilities supplying 1.2 billion standard cubic feet per day (SCFD) of hydrogen to Air Products' Gulf Coast hydrogen system, the world's largest hydrogen plant and pipeline network.

Top things to know about an SMR

What is it?

Steam methane reforming is the most common and economical way to make hydrogen. There are two primary reactions: the reforming reaction and the water gas shift reaction.

In the reforming reaction, natural gas is mixed with steam, heated to over 1,500 degrees Fahrenheit, and reacted with nickel catalyst to produce hydrogen (H_2) and carbon monoxide (CO).



To produce additional hydrogen, CO from the reforming reaction interacts with steam in the water gas shift reactor.



Feedstock:

Natural gas is the most common feedstock in steam reformers; naphtha and refinery off-gas may also be used.

Main components

Furnace

The furnace is where the process of liberating hydrogen from natural gas and steam begins. The gas-and-steam mixture travels down into reformer tubes that hang in vertical rows surrounded by gas burners that heat the mixture. The reformer tubes are full of nickel catalyst, which triggers a reaction, causing the methane in natural gas to react with water vapor to form hydrogen, carbon monoxide, and carbon dioxide.

Water gas shift reactor

Additional hydrogen is created in the water gas shift reactor. The water gas shift reactor is filled with an iron-chrome based catalyst that causes steam (H_2O) to break into oxygen and hydrogen. The hydrogen moves through the plant, while the oxygen joins carbon monoxide from the furnace (reforming reaction) and becomes carbon dioxide (CO_2).

Pressure swing absorbers (PSAs)

The PSAs are used to filter out remaining traces of carbon monoxide, carbon dioxide, steam, and methane from the hydrogen. These leftover gases are used as fuel for the furnace, while the hydrogen is ready for customers. The hydrogen can be put into a hydrogen pipeline or liquefied and moved by truck.

Output

SMRs primarily produce hydrogen. They can also create CO, syngas mixtures (various combinations of hydrogen and carbon monoxide), steam, and electric power for customer use. As Air Products will soon start demonstrating in Port Arthur, Texas, the CO₂ from SMRs may be captured and used for enhanced oil recovery.

Air Products fast fact

Air Products is the world leader in outsourced sale of gas (SOG) hydrogen production and supply. The company owns and operates nearly 2.7 BSCFD of hydrogen production capacity worldwide. Air Products' larger hydrogen plants are built through the global alliance between Air Products and Technip. This alliance, which is celebrating its 20-year anniversary, continues to provide the worldwide refining industry with competitive technology and world-class safety. Technip provides the design and construction expertise for steam reformers, while Air Products provides the gas separation technology. Air Products, through its extensive operating network, and Technip, from its large reference base, also bring effective operational and engineering knowledge to "design-in" high reliability and efficiency. The plants are operated and maintained by Air Products under long-term agreements with customers.

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